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# AN INDUSTRIAL OPPORTUNITY FOR AMERICA.

BY E. SOWERS.

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FEW of the great modern industries have had a more varied and checkered career on the way to final success than the manufacture of sugar from the beet.

In 1747 Marggraf, a modest scholar of Germany, read a paper before the Berlin Academy of Sciences, of which he was a member, in which he announced his discovery of a method of producing sugar from the beet ; he explained the processes of manufacture, and exhibited samples for the inspection of the Academy ; he also expressed his belief that great practical benefits would follow from it, and that Europe would find in that root the basis of an immense industry. The Academy received the announcement with incredulous surprise, and no doubt regarded the opinion of Marggraf as to the importance of his discovery as the dream of an enthusiast and a visionary. Yet his products appealed to the senses in attestation of the verity of his discovery. We doubt if another instance can be found in which the sequel proved that the discoverer at the outset had so just an insight into the scope and magnitude of his discovery, or a truer view of its value and importance. Marggraf was one of the small class of men who were then earnestly devoting themselves to the investigation of those sciences whose glorious possibilities they dimly saw, and faithfully labored to produce. He was poor and without the aid of commercial or political influence. He had watched with cautious zeal the development of his discovery ; he had applied all available tests to detect any error in his methods, or any fallacy in his reasonings ; and having done this he confidently submitted his discovery and his methods to the Academy at Berlin. It was all he could do. The common fate of discoverers

was his, for thenceforth his discovery slept in undisturbed repose for half a century.

In 1797 Achard, a pupil of Marggraf and who shared his master's faith and confidence in the value of the discovery, announced to the Berlin Academy the results of his own improvements in the methods of producing sugar from beets. These improvements were of such a nature as to kindle hope and expectation in the minds of the doubtful and indifferent. The discoveries of Achard had early attracted the attention of Baron de Koppy, who devoted one of his estates in Lower Silesia to the culture of beets, erecting a factory for the manufacture of beet sugar in 1805, and placing both estate and factory under the control of Achard. So great was Achard's confidence that he built a factory on his own estate at Cunern, and on his own account embarked as well in the culture of the beet as in the manufacture of sugar. These enterprises were so successful, under the wise and prudent management of Achard in the financial and manufacturing departments of the business, as to be deemed, in a practical way, brilliant successes. The new industry steadily grew in Germany, and the quality of the products was of such merit and excellence as to sustain with credit rigid tests in comparison with the best samples of sugar produced from cane. Indeed, in respect to quality and excellence, and in ability to serve equally as well all uses to which it may be applied, it must be conceded that beet sugar in less than fifteen years after its first manufacture had won its right to a place by the side of the best sugars produced from cane. It should be stated that William I., King of Prussia, notwithstanding the distresses of his kingdom by reason of war, gave substantial aid to the new industry by exempting from taxes land devoted to the culture of the beet and factories used in the making of sugar, and by liberal loans to assist the manufacturers, many of which he afterwards released without payment. In 1799 Achard announced the discovery and his improved methods of manufacture. He presented samples of his products to the Institute of France at Paris, and expressed his belief that by this method sugar could be produced from the beet at a cost of six cents a pound. The Institute received the announcement with great satisfaction, and were deeply impressed with the possibilities of the discovery, and of its importance and value. A committee was at once chosen from those deemed best fitted to make

the investigation, to whom the subject was referred. A close examination was begun which extended as well to the culture of the beet as to the methods of manufacture. In due time the committee reported ; and this report was so favorable as speedily to lead to many attempts in France to manufacture sugar from beets. These attempts in the main were so successful as to merit and receive imperial favor and support. In a few years the subject came to be viewed with much interest in France ; the products of their manufactories were so large and of such excellent quality as to justify the belief in 1813 that a new industry of the utmost importance and of vast public benefit would be built up in France. Among the rulers and statesmen of Europe the Emperor Napoleon alone clearly saw the magnitude and value of the discovery, and from the outset he favored and encouraged in a substantial manner every interest involved in the subject, and to his favor and support in large measure is due its rapid development and its taking at last a permanent place among the industries of France.

But it should be remembered that the commercial conditions in Europe from 1800 to 1815 were such as to favor and stimulate the production of beet sugar. During that time wars were almost continuous. The commerce of France and of the German States was nearly driven from the seas. Sugar was then produced only in tropical countries, and mostly in the West Indies. The prices per pound for the common varieties during this period in Germany ranged from twelve to thirty-five cents, the best quality of refined sugar sometimes bringing ninety-five cents a pound, and this, too, at a period when the estimated annual consumption per capita was less than two pounds. The conditions of the market and the estimated annual consumption during this time in France were substantially the same as in Germany. It is manifest that these conditions would tend greatly to stimulate the production of beet sugar, and would promise liberal profits on the capital invested. The rapid enlargement of the industry during that period in France and Germany, and the quantity and the excellence of the products, were such as to justify the belief in its complete ultimate success. But the fall of Napoleon, in 1815, and the return of peace again opened the ports and markets of the world. This change in the conditions of trade at once presented a grave problem to the new industry. Can it compete with the products of the cane-growing lands of the tropics ? or will that competition

crush and destroy it ? In due time we shall see the answer which time and events shall give.

Let us briefly note the reception given to the new industry by the people of the leading nations of Europe. In Germany the authority imputed to the Academy at Berlin, the favorable regard of the King and government, and the almost instant success of the new industry by reason of the excellence of its products, there gained for it a respectful hearing on its merits. The gay and volatile wits of France noted the fact that the discovery was of German origin, and for many years in spite of surprising results the new industry was the butt of wit and sarcasm, which abated only after the clearest proofs of the success of the new enterprise. The commercial supremacy of England gave to the opinion prevailing among its commercial classes a weight and authority in Europe which belonged to no other nation. The opinion of these classes in England respecting the production of beet sugar was plain and outspoken ; while few, if any, seem to have made any effort to study the subject, yet ignorance was not deemed to disqualify one from holding and expressing an unqualified opinion as to the folly of the claim that any benefit could come from the new discovery ; indeed, the subject was deemed too contemptible to merit an investigation. It was assailed with a storm of abuse and ridicule such as seldom before had been known. The press swarmed with articles aiming to bring the new industry into contempt and derision ; the stage in play and farce sought to impress its patrons with a conception of the folly of attempting to extract sugar from a root fit only to be food for beasts ; the clubs deemed it a proper target for wit and a fit subject for ridicule ; the newspapers and periodicals taxed the skill of illustrators for grotesque embellishments in aid of every attempt at ridicule to the end that an industry might perish which at bottom was feared as a menace to a great commercial interest of England. Webster in his speech on the tariff in 1824 expressed the views then held by the commercial classes in this country in the following terms :

“ Nor have we been referred to the attempts under the same system to make sugar from common culinary vegetables, attempts which serve to fill the print shops of Europe, and to show us how easy is the transition from what some think sublime to that which all admit to be ridiculous. The folly of some of these

projects has not been surpassed, nor hardly equalled, unless it be by the philosopher in one of the satires of Swift, who so long labored to extract sunbeams from cucumbers."

It is obvious that Webster's knowledge of the subject was obtained from purely English sources; and that the knowledge so derived was so crude and defective as even then to be worthless.

But the storm of wit and ridicule in due time spent its fury, and a calm succeeded. It soon became manifest that those who had best studied the subject, and who best knew the facts respecting it in France and Germany, had unshaken confidence in the new industry. The decade following 1815 brought to the new enterprise its severest trials. During that time the factories in France and Germany were mostly closed, and the fields once devoted to the culture of the beet were applied to other uses. But in a few years the industry and energy of the people had so far restored the trade of Europe as that commercial demands for certain products had increased beyond all former precedents. The demand for sugar had increased one, two and threefold, till the crude and wasteful methods of production then existing in the tropical sugar producing countries were taxed to their utmost and yet failed to supply the demand. In this increased demand will be found a potent factor in solving the problem of the longer continuance of the beet-sugar industry in Europe. In fact the volume of increase had become so large as to surpass the recent exaggerations of wit and ridicule. Under these conditions plans were soon formed to revive the industry in Europe. The culture of the beet was renewed and enlarged and the factories again were opened. In 1835 the industry in France and Germany had fairly started under the new conditions; and that of France was so fortunate as to come for a time under the influence of the sagacious and prudent Delisse, to whose wisdom and courage the ultimate success of the beet-sugar industry in France is greatly indebted.

We submit the following table showing the production of beet sugar in France at intervals of ten years:

In 1829-30 (August 1 to July 31).....	4,380 tons
" 1839-40.....	22,784 "
" 1849-50.....	62,165 "
" 1859-60.....	126,479 "
" 1869-70.....	282,136 "

In 1873 the production had increased to 409,916 tons, while in 1889-90 the production was 750,000 tons.

The annual consumption per capita in France in 1830 was two pounds. For the decade beginning with 1840 the consumption in France increased nearly fourfold. In 1865 the annual per capita consumption was fourteen pounds; while in 1890 it had become twenty-six pounds.

As this industry originated in Germany, so also shall we find there its greatest development. The same causes which depressed and almost ruined it in France from 1815 to 1829 also operated with like disastrous results during that time in Germany. But the same causes which tended to revive the industry in France also produced a like effect in Germany, and in a few years the culture of the beet was largely increased and the number of factories were rapidly multiplied.

The following table will show the production in Germany for the years named, and will serve also to show the uniform and steady increase of the production:

	Sugar, tons.	Molasses, tons.
For 1840.....	13,445	8,955
" 1850.....	52,586	19,877
" 1860.....	126,526	35,224
" 1865.....	180,000	50,544
" 1871-72.....	186,442	63,893
" 1881-82.....	599,722	150,813
" 1889-90.....	1,213,689	240,797

Such an increase in production for half a century, during which every influence that tends to stimulate or depress it was at times present and in active operation, can leave no doubt of the sure and firm foundation on which the industry at last rests in the commercial world.

The following statement will show the exports of sugar products for the years named:

In 1876-77.....	57,953 tons
" 1886-87.....	643,340 "
" 1889-90.....	718,985 "

These statements tend to show the growth and magnitude of this industry in Germany. It is there no longer an experiment; it has gained a place among the great industries of the nation, nay, of the world; and it promises well to maintain the position which after a long and severe contest and with many reverses it has at last won. In 1890 the people of the United States paid to the manufacturers of Germany \$16,000,000 for about 200,000 tons of beet sugar imported into the United States, nearly three

times more than they paid that year for any other article imported from Germany.

That portion of the United States in and near the latitude of the lakes and extending from ocean to ocean seems to unite in happy proportions all the elements that tend to the production of the sugar beet as good in quality as are anywhere grown. Parts of Kansas, Nebraska, the Dakotas, and California and Utah, have already been devoted to the culture of the sugar beet, with such results as respects quantity and excellence as to give good reason for expecting a brilliant future for the new industry.

The rich soils of California and Utah, their warm and even climate, leave no want in these respects unsupplied ; and when irrigation is added the yield is surprising as well for its abundance as its excellence. The production of beet sugar in the United States was :

In 1891.....	12,004,838 lbs.
" 1892.....	27,003,322 "
" 1893.....	44,836,527 "

Of this quantity Nebraska produced in 1891 2,734,500 lbs.; in 1892, 3,808,511 lbs., and in 1893, 5,835,900 lbs. In 1892 California produced about 20,000,000 lbs., and other parts of the United States about 3,000,000 lbs. Nebraska and the Dakotas seem to be specially adapted to the culture of the sugar-beet, and in Nebraska also is found one of the most successful manufactories of beet sugar. There, to a natural richness of soil is added, in the season of rapid growth, a sufficient rainfall to supply the needed moisture, while the temperature for the months of June, July, August, and September is so high and even as to bring the beet to full maturity early in October. The farmers of Nebraska seemed to have learned their advantages in this industry, and the quantity of land now annually devoted to the culture of the beet is steadily increasing, and meantime a better understanding of the methods of cultivating the beet has led to results beneficial as well to the farmer as to the manufacturer. Indeed, in Nebraska and the Dakotas, the opinion now seems to be quite prevalent that the sugar beet will equal in profit to the farmer any crop there grown. The experience of the growers of the beet and of the manufacturers of beet sugar, hitherto, in this country, has been much the same as of the like classes in France and Germany. Indeed, it now seems probable that the late improvements in the methods of manufacturing beet sugar, and a better



knowledge of the conditions which tend to increase the yield of beets and to improve their quality, have solved for us the problem of the profitable cultivation of the beet for the farmer, and of the making of beet sugar for the manufacturer.

The conditions in the United States for the development of this industry for the past few years have not been favorable. The repeal of the bounty clause in the late tariff act, and the withholding of bounties payable under it till the late decision of the Supreme Court, with the importation of foreign sugars free of duty, have brought the beet growers and the manufacturers of beet sugar into free competition with the sugar producers of the world. It is quite probable that the late increase of the national debt will lead to the imposition of duties on imported foreign sugars, and that in this way some measure of protection will be given to domestic sugar producers. We have no *data* at hand of the production of beet sugar in the United States for 1894 and 1895. The United States spends annually about \$135,000,000 for sugar, of which more than eight-tenths goes to foreign countries. We consume one-fourth of the exported sugar product of the world. The magnitude and the value of the trade is clearly shown by this vast annual expenditure.

A summary of a few important facts respecting this industry may be of general interest. The yield of sugar-beets varies from twelve to forty tons per acre. The best land with good cultivation and a favorable season will yield from twenty to thirty-five tons per acre, but the crop would be hardly profitable at a yield of less than twelve tons per acre. In California the greatest production from a single acre of land was a little more than forty tons of beets; but this is an unusual yield. The estimated cost of production per acre is about fifty dollars. In the present condition of the methods of manufacture, from eight to twelve pounds of beets are required in the making of one pound of sugar; the quantity varies according to the greater or lesser richness of the beets in sugar. The price changes with the conditions of the market. About four years ago beet sugar from Germany was landed on the wharves of New York at a cost of three dollars and eighty-one cents a hundred pounds. It rarely now costs above five cents a pound. Very great improvements in the processes of manufacture have been made since 1835. Then from four to five per cent. of the beet could be converted into sugar, as against

twelve to sixteen now ; then the cost of production per pound was eight to twelve cents, against two to four now. In 1893 the average cost per pound of manufacture in the United States was three cents ; and twenty-four thousand acres of land was that year applied to the growth of sugar-beets, which brought to the farmer an average price of four dollars and fifty cents a ton. In 1893 there were seven beet-sugar manufactories in the United States with a capital of about two million dollars. The statistics respecting this subject in the United States for 1893 (and this was one of the poorest seasons for production) show that the sugar product from the beets grown on an acre of land was from 3,661 to 4,620 pounds. As respects quality and fitness for any use to which sugar is now applied, it is not questioned that beet sugar is in all points the equal of cane sugar.

The annual consumption of sugar per capita in England is sixty pounds ; in France and Switzerland it is twenty-six pounds ; in Germany it is eighteen pounds ; while in the United States it is forty-four pounds. France, Germany, and Austria now produce beet sugar enough for home consumption ; and but little sugar is now imported into either of these countries, while Germany and France annually export large quantities. Fifty years ago ninety-four per cent. of the annual sugar product of Cuba found a market in Europe ; now that proportion of its production is sold in the United States.

We submit that these facts respecting the growth and development of this industry in Germany show that the prevision of Marggraf in regard to the value and practical importance of his discovery, and that it would become the basis of a great industry, was accurate in every particular. So also was the confidence of Achard, manifested when he announced the discovery to the Institute of France, as to its importance, and as to the price at which by this process sugar could at last be produced, fully justified by the course of events. For a series of years in France and Germany this industry was favored by duties on foreign sugars, by bounties, by exemption from taxes, and by taxes on imported sugars ; till the vast increase of consumption, cheap labor, the joint skill of producers and manufacturers, have given it at last such strength as to enable it to compete successfully with the sugars produced from cane. In 1892 the manufacturers of Germany sold to English purchasers nearly six hundred thousand

tons of beet sugar, all of which was the product of their own fields and manufactories. If France, Germany, and Austria can obtain from beets grown on their own lands and made by their own manufacturers their supply of sugar for domestic uses, and have left besides three-fourths of a million tons for annual exportation to foreign countries, why should not the farmers and manufacturers of the United States grow the beets and make the sugar needed for domestic uses, and so save for all the wages and profits incident to such an industry? It cannot be doubted that the natural conditions in the United States are as favorable for this object as they were in France, Germany, and Austria; and hence no reason in the nature of things exists why this industry should not flourish among us, nor why our farmers, manufacturers, and capitalists should not save this large annual foreign expenditure, and assist to further diversify our industries, and increase the skill of our artisans, by a new addition thereto of immense value and of great practical usefulness.

E. SOWERS.